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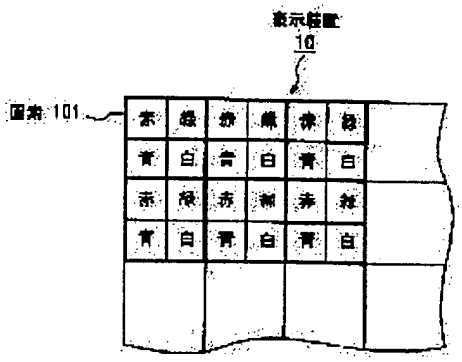
(54) DISPLAY DEVICE AND CONTROL METHOD THEREOF

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a display device and a control method thereof wherein a high brightness level can be achieved with a low electric consumption.

SOLUTION: In this control method, each pixel 101 of a dot matrix consists of four pieces of light emitting elements emitting red, green, blue, and white, and when the brightness levels of the color signals for driving each of the red, green, and blue light emitting elements exceed a prescribed value, the white light emitting element is driven to emit light. Since high brightness can be achieved by making the newly arranged white light emitting element emit light, electric consumption is reduced.



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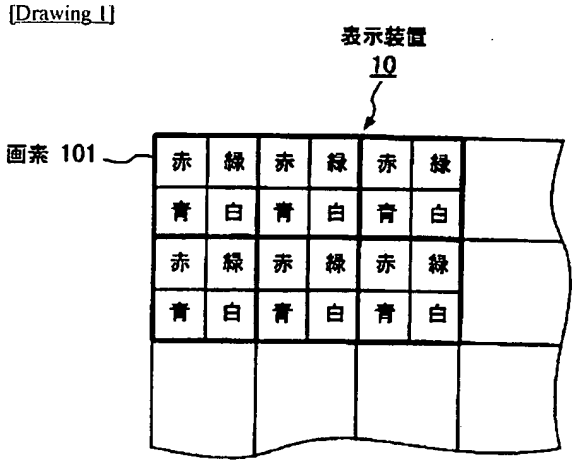
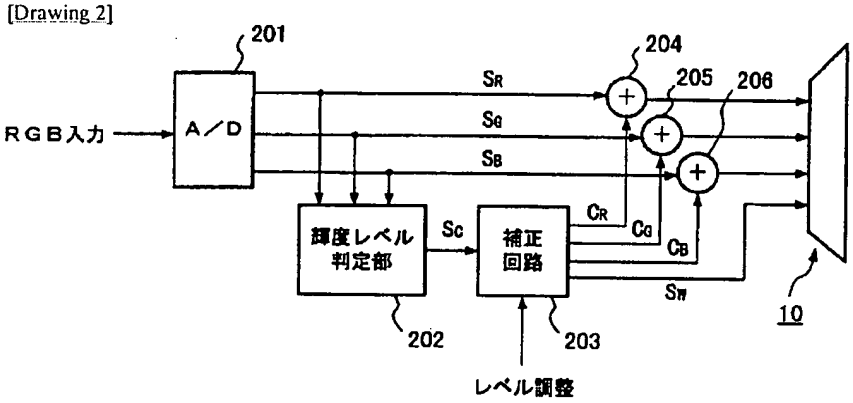
DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to display, especially relates to the display using the dot matrix, and its control method.
[0002]
[Description of the Prior Art] Display like the plasma screen display using the dot matrix has realized color display by the dot matrix which constitutes 1 pixel from three elements which generally emit light in the three primary colors of red (R), green (G), and blue (B).
[0003] The principle of a light emitting device is the same as that of the principle of a fluorescence pipe, the fluorescent paint which emits light to R, G, and B is applied to the interior of the glass plate of a couple, and fluorescent paint is made to emit light by applying ultraviolet rays there.
[0004] Colorization of such a plasma display is usually realized using a RGB coloring filter or a RGB fluorescent substance. For example, to JP,7-169403,A, the full color display is realized using a RGB fluorescent substance. White repeatability is brought close to CRT (Cathode Ray Tube) by constituting a green fluorescent substance from mixture of G fluorescent substance and B fluorescent substance especially.
[0005]
[Problem(s) to be Solved by the Invention] However, since the intensity level is [Braun-tube CRT / composition / conventional / above-mentioned] / low, in the place where the circumference is bright, a picture becomes hard to see and it is required that an intensity level should be improved further. Furthermore, it is also required that high brightness should be attained by the low power.
[0006] The purpose of this invention is to offer the display which can attain a high intensity level by the low power, and its control method.
[0007]
[Means for Solving the Problem] Display by this invention is characterized by the bird clapper from four light emitting devices to which each pixel of a dot matrix emits light in red, green, blue, and white. Since the light emitting device which emits light in white can raise the intensity level of a pixel, surrounding brightness becomes usable enough also in a high place. Furthermore, compared with the display of the composition by the conventional red and three green and blue elements, a high intensity level can be attained by the low power.
[0008] furthermore, the control means which the display by this invention drives the light emitting device which will emit light in the aforementioned white if the intensity level of the chrominance signal which drives a display means by which each pixel of a dot matrix consists of four light emitting devices which emit light in red, green, blue, and white, red and green, and a blue light emitting device, respectively exceeds a predetermined value, and are made to emit light -- since -- it is characterized by the bird clapper Since light will be emitted if the intensity level of a pixel exceeds a predetermined value, and the newly prepared white light emitting device becomes usable and moreover makes one light emitting device per pixel only emit light also in a bright place, it can attain a low power.
[0009]
[Embodiments of the Invention] Drawing 1 is the pixel block diagram showing 1 operation gestalt of the display by this invention. 1 pixel of display 10 of this operation gestalt consists of red, green, blue, and four white light emitting devices per 101. The light emitting device of each color may be for example, a plasma light emitting device, and the thing using the coloring filter is sufficient as it, and it may be made to emit light here using the fluorescent substance of each color, as mentioned above.
[0010] Drawing 2 is the circuit diagram showing an example of the display amendment circuit in this operation gestalt. An analog-RGB signal is changed into a digital signal by A/D converter 201. A/D converter 201 is outputted to adders 204-206, respectively while it outputs the digital R signal SR, the digital G signal SG, and the digital B signal SB to the intensity-level judging section 202.
[0011] When the sum total of digital RGB codes SR, SG, and SB exceeds constant value so that it may mention later, the intensity-level judging section 202 generates the amendment control signal SC, and outputs it to the amendment circuit 203. The amendment circuit 203 generates the red amendment signal CR, the green amendment signal CG, the blue amendment signal CB, and the white signal SW according to the amendment control signal SC, outputs the red amendment signal CR, the green amendment signal CG, and the blue amendment signal CB to adders 204-206, respectively, and outputs the white signal SW to display 10. In addition, the amendment circuit 203 can adjust each level of the RGB amendment signals CR, CG, and CB, and the level of the white signal SW. for example, the RGB amendment signals CR, CG, and CB can attain the same intensity level more at low power consumption by carrying out constant-rate elevation of the level of the white signal SW for each level of digital RGB codes SR, SG, and SB at the bottom wooden-clogs case of a constant rate
[0012] An adder 204 adds the digital R signal SR and the red amendment signal CR, and outputs a red signal to display 10. Similarly, an adder 205 adds the digital G signal SG and the green amendment signal CG, and outputs a green signal to display 10, and an adder 206 adds the digital B signal SB and the blue amendment signal CB, and outputs a blue signal to display 10.
[0013] Thus, the acquired red signal, a green signal, a blue signal, and the white signal SW are outputted to display 10, and the red who constitutes each pixel, green, blue, and four white light emitting devices are made to emit light in the amount of luminescence to which the signal level of each color responded. Since the drive circuit of each light emitting device of a plasma display itself is common knowledge, it omits explanation here.
[0014] As shown in Table 1, when the total value of digital RGB codes SR, SG, and SB exceeds constant value (here, it is 180h by hexadecimal display), according to the RGB total value, the intensity-level judging section 202 changes the amendment control signal SC, and the level of the white signal SW changes the amendment circuit 203 according to the amendment control signal SC.
[Table 1]

RGBトータル値	補正制御信号Sc	白色信号Sw
0h～180h	0000h	00h
181h～1B0h	0008h	0Fh
1B1h～1E0h	0009h	1Fh
1E1h～210h	000Ah	2Fh
211h～240h	000Bh	3Fh
241h～270h	000Ch	4Fh
271h～2A0h	000Dh	5Fh
2A1h～2D0h	000Eh	6Fh
2D1h～2FDh	000Fh	7Fh

[0015] Thus, the high display of an intensity level is attained by changing the level of the white signal SW. And since an intensity level can be increased only by increasing the amount of luminescence of one white light emitting device per pixel, a daylight display can be obtained with low power rather than it raises simultaneously the amount of luminescence of three RGB light emitting devices.
[0016] Furthermore, it also becomes possible to attain an intensity level of the same grade with lower power by reducing each level of the RGB digital signals SR, SG, and SB with the RGB amendment signals CR, CG, and CB which the amendment circuit 203 generates, and making the level of the white signal SW increase. For example, adjusting is also possible as it supposes that a RGB amendment is performed when 3 figures of high orders of the amendment control signal SC are "111h", and shown in Table 2.
[0017]
[Table 2]

RGBトータル値	補正制御信号 Sc	白色信号 Sw	赤色補正信号 C_R	緑色補正信号 C_G	青色補正信号 C_B
0h～180h	1110h	00h	00h	00h	00h
181h～1B0h	1118h	0Fh	-05h	-05h	-05h
1B1h～1E0h	1119h	1Fh	-0Ah	-0Ah	-0Ah
1E1h～210h	111Ah	2Fh	-10h	-10h	-10h
211h～240h	111Bh	3Fh	-15h	-15h	-15h
241h～270h	111Ch	4Fh	-1Ah	-1Ah	-1Ah
271h～2A0h	111Dh	5Fh	-1Fh	-1Fh	-1Fh
2A1h～2D0h	111Eh	6Fh	-29h	-29h	-29h
2D1h～2FDh	111Fh	7Fh	-2Fh	-2Fh	-2Fh

[0018]
[Effect of the Invention] According to this invention, it becomes possible by preparing a white light emitting device in addition to three conventional RGB light emitting devices to realize the high display of an intensity level with low power. Furthermore, since a high intensity level can be obtained with low power, it can be used in a bright place and using for the display of a pocket device also becomes possible.

[Translation done.]

CLAIMS

[Claim(s)]

[Claim 1] It is the display characterized by the bird clapper from four light emitting devices to which each pixel of the aforementioned dot matrix emits light in red, green, blue, and white in the display using the dot matrix.

[Claim 2] Display characterized by the control means which the light emitting device which emits light in the aforementioned white is driven [control means], and make it emit light when the intensity level of the chrominance signal which drives a display means by which each pixel of a dot matrix consists of four light emitting devices which emit light in red, green, blue, and white, the aforementioned red and green, and a blue light emitting device, respectively exceeds a predetermined value, and the shell bird clapper.

[Claim 3] The aforementioned control means are display according to claim 2 characterized by increasing the amount of luminescence of the light emitting device which emits light in the aforementioned white according to the difference of the aforementioned intensity level and the aforementioned predetermined value.

[Claim 4] The aforementioned control means are display according to claim 2 characterized by increasing the amount of luminescence of the light emitting device which emits light in the aforementioned white according to the difference of the aforementioned intensity level and the aforementioned predetermined value, and decreasing the aforementioned red, green, and the amount of luminescence of a blue light emitting device according to the difference of the aforementioned intensity level and the aforementioned predetermined value.

[Claim 5] The control method of the display characterized by what the light emitting device which will emit light in the aforementioned white if the intensity level of the chrominance signal which drives the aforementioned red, green, and a blue light emitting device, respectively is computed in the control method of display that each pixel of a dot matrix consists of four light emitting devices which emit light in red, green, blue, and white and the aforementioned intensity level exceeds a predetermined value is driven for.

[Claim 6] The control method of the display according to claim 5 characterized by increasing the amount of luminescence of the light emitting device which emits light in the aforementioned white according to the difference of the aforementioned intensity level and the aforementioned predetermined value.

[Claim 7] The control method of the display according to claim 5 characterized by what the amount of luminescence of the light emitting device which emits light in the aforementioned white according to the difference of the aforementioned intensity level and the aforementioned predetermined value is increased, and the aforementioned red, green, and the amount of luminescence of a blue light emitting device are decreased for according to the difference of the aforementioned intensity level and the aforementioned predetermined value.

[Translation done.]